S'COOL

CERES • NASA • STUDENTS' CLOUD OBSERVATIONS ON-LINE

National Standards in science, math, technology, and geography are met as S'COOL participants observe, compute, and locate vital information.

The front of this poster is to be used as an aid to students' observations of cloud type. The reverse may be reproduced as a set of four 8 1/2 by 11 inch sheets and provides additional information on weather measurements to be made. Results of observations should be recorded and sent to S'COOL using forms provided upon registration.

TO REGISTER OR FOR MORE INFORMATION:

Check out the S'COOL web site
http://asd-www.larc.nasa.gov/SCOOL/

Or write to us at
The CERES S'COOL Project
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CLOUDS

Type (see front of this poster)
- ❏ None
- ❏ Low Altitude:
    - ❏ Stratus
    - ❏ Stratocumulus
    - ❏ • Nimbostratus
    - ❏ Cumulus
    - ❏ Cumulonimbus
    - ❏ • Fog
- ❏ Mid Altitude:
    - ❏ Altostratus
    - ❏ Altocumulus
- ❏ High Altitude:
    - ❏ Cirrus
    - ❏ Cirrocumulus
    - ❏ • Cirrostratus
    - ❏ Contrails (the condensation trails created by airplanes)

Fraction (Please determine the following for each level of clouds, if visible.)
How much of the sky is covered by clouds at that level?
- ❏ None (0%)
- ❏ • Clear (0-5%)
- ❏ • Partly Cloudy (5-50%)
- ❏ Mostly Cloudy (50-95%)
- ❏ • Overcast (95-100%)

Visual Opacity (Please determine the following for each level of clouds present.)
How thick are the clouds, and how much sunlight can penetrate them?
- ❏ Opaque (thick clouds which do not allow light to pass through)
- ❏ Translucent (medium-thickness clouds; some light filters through)
- ❏ Transparent (thin clouds, light passes easily, some sky visible through clouds)

SURFACE COVER

- ❏ Snow/Ice
- ❏ Standing water
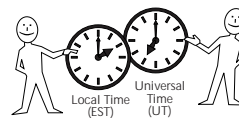- ❏ Muddy ground
- ❏ Dry ground
- ❏ Leaves on trees

TIME

The time that the satellite passes overhead is given in Universal Time (UT), which is the time standard worldwide. Unfortunately, the time shown on your watch isn't. Watches are normally set to "local time." It is relatively simple to convert local time into UT.
Consult the following table:

USA Time Zone	To change from local time to UT	To change from UT to local time
Eastern Standard Time (EST)	+5 hrs	-5 hrs
Eastern Daylight Time (EDT)	+4 hrs	-4 hrs
Central Standard Time (CST)	+6 hrs	-6 hrs
Central Daylight Time (CDT)	+5 hrs	-5 hrs
Mountain Standard Time (MST)	+7 hrs	-7 hrs
Mountain Daylight Time (MDT)	+6 hrs	-6 hrs
Pacific Standard Time (PST)	+8 hrs	-8 hrs
Pacific Daylight Time (PDT)	+7 hrs	-7 hrs

Conversions for other parts of the world are as follows; but if Daylight Savings Time is in effect the times will need to be adjusted.

City or Region	To change from local time to UT	To change from UT to local time
Samoa	+11 hrs	-11 hrs
Hawaii	+10 hrs	-10 hrs
Alaska	+9 hrs	-9 hrs
Continental USA	See above	See above
Newfoundland	+4 hrs	-4 hrs
Brazilia, Buenos Aires	+3 hrs	-3 hrs
Cape Verdes	+1 hour	-1 hour
Greenwich, Dublin	+/- 0	+/- 0
Rome, Paris, Berlin	-1 hour	+1 hour
Israel, Cairo	-2 hrs	+2 hrs
Moscow, Kuwait	-3 hrs	+3 hrs
Islamabad, Karachi	-5 hrs	+5 hrs
Bangkok, Jakarta	-7 hrs	+7 hrs
Hong Kong, Beijing, Singapore	-8 hrs	+8 hrs
Tokyo, Osaka	-9 hrs	+9 hrs
Sydney, Melbourne, Guam	-10 hrs	+10 hrs

Local Time (EST)   Universal Time (UT)

LATITUDE & LONGITUDE

Satellite measurements are mapped in terms of longitude/latitude. To coordinate your observations with the satellite overpass you will need to know the latitude and longitude of your school.

Latitude is a measure of how far north or south of the Equator a place is. It is measured in degrees (°); 90° North is the North Pole; 90° South is the South Pole; and 0° is the Equator.

Longitude is a measure of how far east or west a place is. It is also measured in degrees. 0° longitude runs through Greenwich, England and is called the **Prime Meridian**. 90° East longitude runs through Bangladesh; 90° West longitude crosses Guatemala; and 180° longitude (East or West, because the Earth is round) runs through the Pacific Ocean and is called the International Dateline.

NASA Langley Research Center:
Latitude: 37.09 N
Longitude: -76.38 E or 76.38 W

Your school:
Latitude: _____
Longitude: _____

### Latitude & Longitude

Latitude lines
Longitude lines
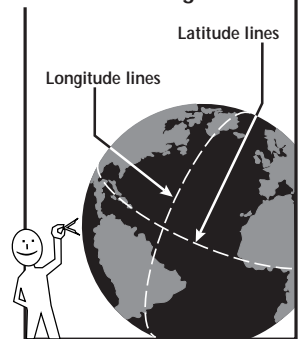
AIR PRESSURE

Air pressure is measured using a barometer. Daily pressures can be obtained by calling a local airport or the weather service. You can also make a simple (albeit less than 100% accurate) barometer from a bowl and a glass of water:
1. Clip 4 paper clips to the rim of the glass.
2. Fill the glass about 3/4 full of water.
3. Place the bowl like a hat over the glass of water.
4. Invert the bowl and the glass so that the bowl is upright, with the glass upside-down inside it. Some water will remain in the glass.
5. Mark the level of the water on the glass with a grease pencil; mark this line with the reading given on a TV weather report. A drop in the water level in the glass will indicate a drop in air pressure (in the long term it could also indicate evaporation.)

On television reports, pressures are often given in inches of mercury. Scientists prefer to use hectoPascals (hPA). Here is some help to convert units:

| If your measurement is	Multiply by this to get hectoPascals:
Millibars (mB)	1
Torr (mm of mercury)	1.33
Inches of mercury	33.86
Pounds per Square Inch (psi)	68.95

Glass
Water
Bowl
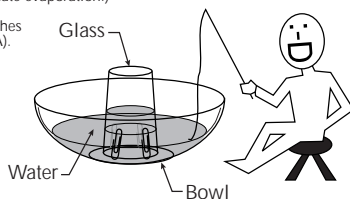
TEMPERATURE

Always take temperature readings in the shade. Direct sunlight will make a thermometer read too high. Also, if you bring a thermometer from inside, be sure to allow enough time for the temperature reading to stabilize.

To convert from Fahrenheit to Celsius:

$$°C = \frac{5}{9}(°F - 32)$$
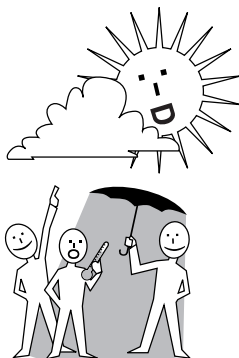
Temperature Conversion Chart

Temp (°F)	Temp (°C)
100	37.8
95	35.0
90	32.2
85	29.4
80	26.7
75	23.9
70	21.1
65	18.3
60	15.6
55	12.8
50	10.0
45	7.2
40	4.4
35	1.7
32	0
30	-1.1
25	-3.9
20	-6.7
15	-9.4
10	-12.2
5	-15.0
0	-17.8

EDUCATIONAL EXCELLENCE

S'COOL is a unique opportunity that involves students in collaborative research with NASA scientists, thus creating a learning opportunity as well as educating inquisitive minds.

National Aeronautics and Space Administration

RELATIVE HUMIDITY

You can figure out relative humidity by using an improvised psychrometer. Here's how:

1. Read an outside thermometer's temperature in Celsius.
2. Next, tie 1 layer of wet paper towel around the thermometer bulb with a rubber band. Make sure the wet towel is touching the bulb.
3. Wave the thermometer vigorously for 1 full minute.
4. Check the new temperature reading and subtract it from the original reading.
5. Consult the table to find the percent (%) relative humidity.

This system works because more moisture evaporates from the towel in drier air, taking heat with it.

NOTE: Because actual readings will also vary with pressure, you may wish to compare your values with those given on a weather report.

RELATIVE HUMIDITY FROM WET- AND DRY-BULB READINGS
(Values given in percent,%)

Dry Bulb Reading (°C)	Dry Bulb Reading - Wet Bulb Reading (°C)																	
	0	1	2	3	4	5	6	7	8	9	10	12	14	16	18	20
-20	100	28														
-18	100	40														
-16	100	48	0													
-14	100	55	11													
-12	100	61	23													
-10	100	66	33	0												
-8	100	71	41	13												
-6	100	73	48	20	0											
-4	100	77	54	32	11											
-2	100	79	58	37	20	1										
0	100	81	63	45	28	11										
2	100	84	68	52	37	22	8									
4	100	85	70	56	42	29	26	3								
6	100	86	73	60	47	34	22	11								
8	100	87	75	63	51	39	28	18	7							
10	100	88	76	65	54	44	33	23	14	4						
12	100	89	78	67	57	47	38	29	20	11	3					
14	100	89	79	69	60	51	42	33	25	17	9					
16	100	90	80	71	63	54	46	38	30	22	15					
18	100	91	81	73	64	56	48	41	33	26	19	6				
20	100	91	82	74	66	58	51	44	37	30	24	11				
22	100	91	83	75	68	60	53	46	40	34	27	16	5			
24	100	92	84	76	69	62	55	49	43	37	31	20	9			
26	100	92	85	77	70	64	57	51	45	39	34	23	14	4		
28	100	92	85	78	72	65	59	53	47	42	37	26	17	8		
30	100	93	86	79	73	67	61	55	49	44	39	29	20	12	4	
32	100	93	86	80	74	68	62	56	51	46	41	32	23	15	8	1
34	100	93	87	81	75	69	63	58	53	48	43	34	26	18	11	5
36	100	93	87	81	75	70	64	59	54	50	45	36	28	21	14	8
38	100	94	88	82	76	71	65	60	56	51	47	38	31	23	17	11
40	100	94	88	82	77	72	66	62	57	52	48	40	33	26	19	13
42	100	94	88	83	77	72	67	63	58	54	50	42	34	28	21	16
44	100	94	89	83	78	73	68	64	59	55	51	43	36	29	23	18

Relative Humidity (%)